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ME-AC-ENO-1 v.1.0.9

ME-AC-ENO-1C v.1.0.9

EnOcean Interface for Mitsubishi Electric air conditioners.
Compatible with all models of Domestic and Mr. Slim lines of air conditioners commercialised in Europe.

User's Manual

v1 r7 eng

Reference: **ME-AC-ENO-1 / 1C**
Issue Date: 05/2010

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1. Presentation

ME-AC-ENO-1 and ME-AC-ENO-1C devices allow a complete and natural integration of Mitsubishi Electric air conditioners with EnOcean control systems both in their 868 MHz (ME-AC-ENO-1) and 315 MHz (ME-AC-ENO-1C) versions.

Compatible with all models of Domestic and Mr. Slim lines of air conditioners commercialised in Europe. Other models from different lines are compatible too (check section 8).

1.1. *Main Features:*

- Reduced dimensions.
- Quick installation.
- External power not required.
- Direct connection to the Mitsubishi Electric AC indoor unit.
- Fully EnOcean interoperable.
- Multiple profiles
- Control of the AC unit based in the ambient temperature read by the own AC unit, or in the ambient temperature read by any EnOcean thermostat.
- Total Control and Monitoring of the AC unit from EnOcean, including monitoring of AC unit's state of internal variables, and error indication and error code.
- AC unit can be controlled simultaneously by the IR remote control of the AC unit and by EnOcean devices.
- Implements the newly approved HVAC EEP's
- Advanced room control functionalities.
- Configurable to work as a repeater.

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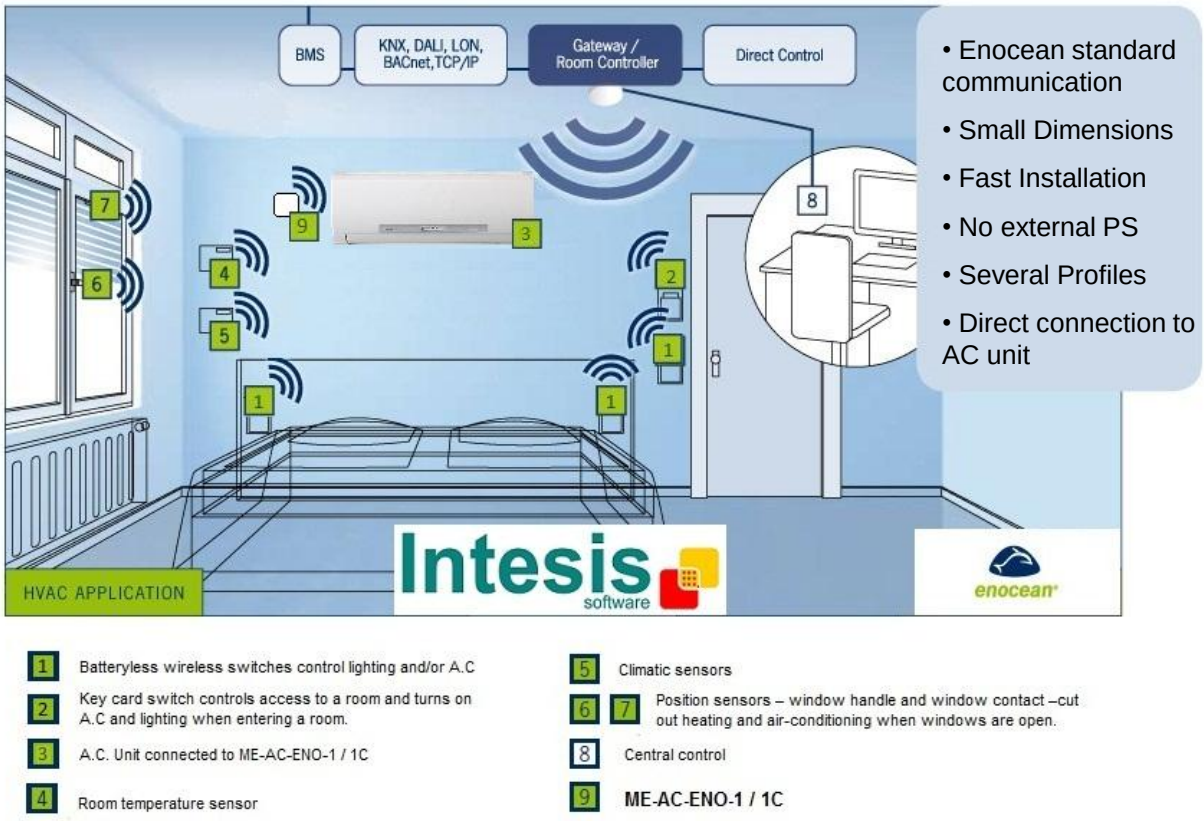
1.2. *Typical Application*

In Figure 1.1 it is shown a typical application of ME-AC-ENO-1 / 1C in a hotel room. The different devices that control the A.C unit, like switches, Key cards, window contacts, are connected to it through the ME-AC-ENO-1 / 1C.


BMS
KNX, DALI, LON, BACnet, TCP/IP
Gateway / Room Controller
Direct Control
• Enocean standard communication
• Small Dimensions
• Fast Installation
• No external PS
• Several Profiles
• Direct connection to AC unit
HVAC APPLICATION
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enocean
1 Batteryless wireless switches control lighting and/or A.C
2 Key card switch controls access to a room and turns on A.C and lighting when entering a room.
3 A.C. Unit connected to ME-AC-ENO-1 / 1C
4 Room temperature sensor
5 Climatic sensors
6 7 Position sensors – window handle and window contact –cut out heating and air-conditioning when windows are open.
8 Central control
9 ME-AC-ENO-1 / 1C

Figure 1.1 Typical application of ME-AC-ENO-1 / 1C in a hotel

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A schematic view of what it could be the application shown in Figure 1.1 can be seen in Figure 1.2. The connection diagram of the A.C with the ME-AC-ENO-1 / 1C and some of the supported EnOcean devices are shown

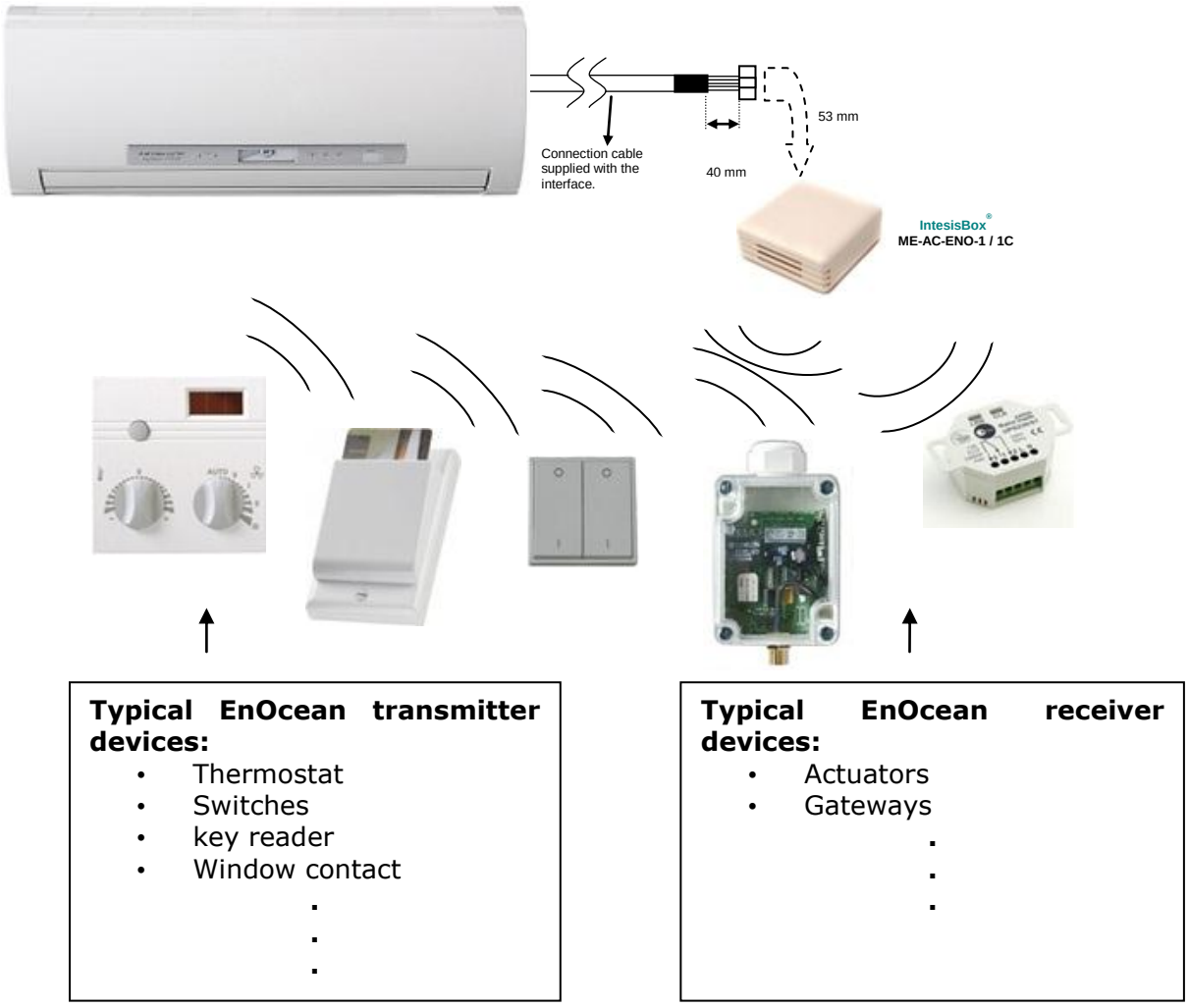

Figure 1.2 Example of ME-AC-ENO-1 / 1C control or actuation devices

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2. Connection and placement

2.1. *Connection*

Disconnect mains power from the AC unit. Open the front cover of the indoor unit in order to have access to the internal control board. In the control board locate the socket connector marked as:

CN92 in Mr.Slim models.
or
CN105 in any other models.

Using the cable that comes with the interface, insert one of its connectors, the one installed in the shortest uncovered part, into the socket of the ME-AC-ENO-1 / 1C, and the other connector, the one installed in the largest uncovered part, to the socket **CN92** or **CN105** of the AC unit's electronic circuit. Close the AC indoor unit's front cover again.

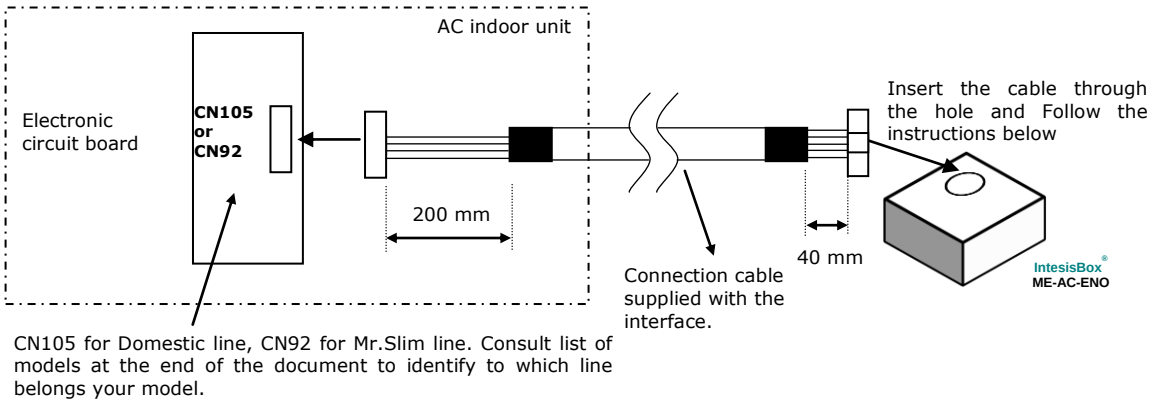
AC indoor unit
Electronic circuit board
CN105 or CN92
200 mm
Insert the cable through the hole and Follow the instructions below
40 mm
Connection cable supplied with the interface.
IntesisBox® ME-AC-ENO
CN105 for Domestic line, CN92 for Mr.Slim line. Consult list of models at the end of the document to identify to which line belongs your model.

Figure 2.1 Device connection diagram

Important: Extending or shortening the length of connection cable included with the interface may cause it to malfunction.

To connect the device to the AC, the recommended methods are the ones in Figure 2.2

- Method1: The lead hole is place above CON1 (Figure 2.2 or Figure 3.1)
- Method2: The lead hole is placed on the opposite side. Use the supplied staple to fix the cable to the screw used for wall fixing.

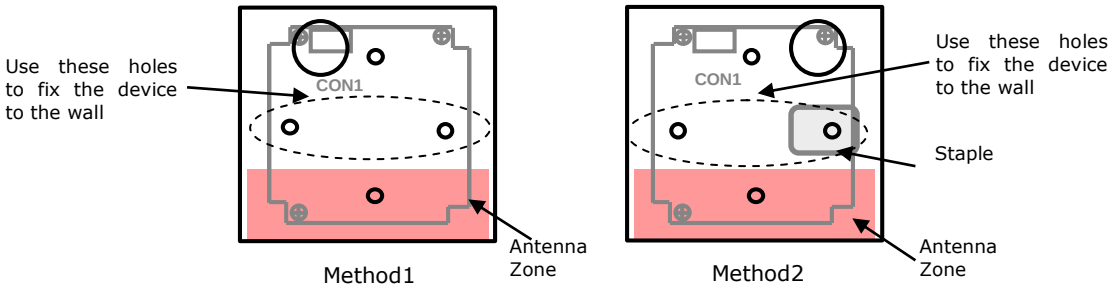

Figure 2.2 Connection methods

Important: The cable should not be placed on top or the antenna zone (area marked in Figure 2.2) as the performance of the device might be affected. For this same reason never use a metallic screw in the subjection hole on top of this antenna zone.

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2.2. *Placement*

The ME-AC-ENO-1 / 1C interface antenna has a better sensibility when the device is placed vertically, and therefore this is the preferred position when placed (antenna zone should be located in the bottom side, floor side, once the device is fixed to the wall).

The coverage distance (see Table 2.1) of the signal emitted by the ME-AC-ENO-1 / 1C, or by any other EnOcean device, is determined by the room geometry and where they are placed. As an example, long narrow corridors with wide walls are an adverse situation. People or other obstacles can reduce the coverage distance too. Is therefore advice to always think in the worst possible scenario to decide the placement of the device to ensure a good stability in the radio system.

Coverage distance	Conditions
< 30 m	Under ideal conditions: Broad room, no obstacles and good antenna positions.
< 20 m	The room is filled with furniture and people And penetration through up to 5 dry walls or up to 2 brick walls or up to 2 aero concrete walls
< 10 m	Identical to the previous case but the receiver is placed to a room corner or range along a narrow floor.
< 1 m	Metal-reinforced ceilings at upright penetration angle (in strong dependence of reinforcement density and antenna positions).

Table 2.1 Device coverage distance

2.2.1 Screening zones

It is important not to place the device in a place where the airwaves must go through a metallic object as they create a screening zone where the receivers are not going to be able to receive the EnOcean telegrams. This situation is shown in Figure 2.3a.

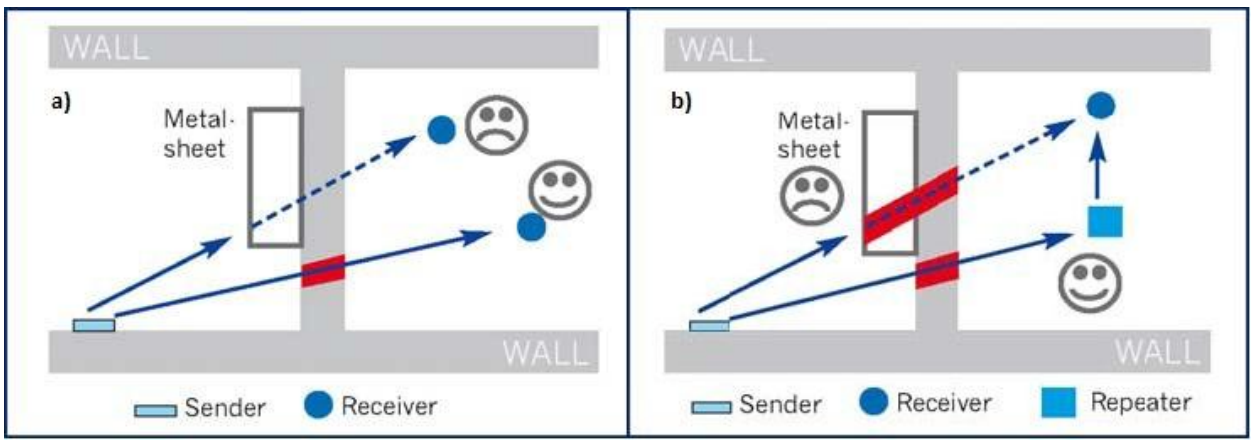

Figure 2.3 a) Screening zone b) solution with a repeater

The situation of one of the receivers doesn't allow it to receive the transceiver telegrams. To solve this situation the use or a repeater outside the screening zone (Figure 2.3b) is recommended. The telegrams will be retransmitted from there to the receiver

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2.2.2 Penetration Angle

This is the angle in which the airwaves reach a certain object they need to go through. The transmission to the other side of the object would be better as this angle gets closer to 90 º, being this the best transmission situation

In Figure 2.4a it is shown a receiver in a situation where the penetration angle is too close to 0º. The solution to that problem can be seen in Figure 2.4b using a repeater in a different position

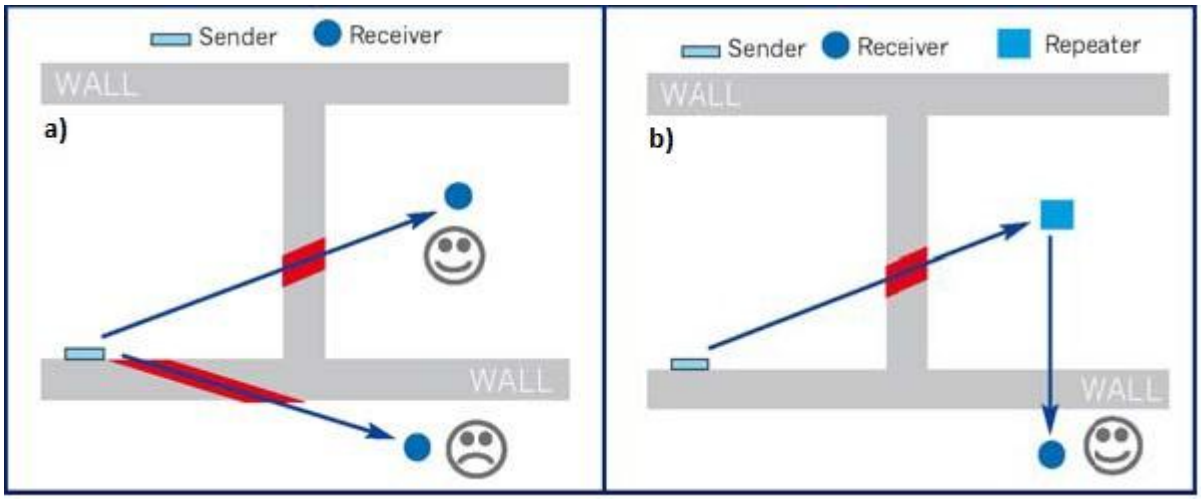

Figure 2.4 Penetration angle

2.2.3 Distance between Receiver and sources of interference

The distance between EnOcean receivers, as it is the ME-AC-ENO-1 /1C, and other transmitters (e.g. GSM / DECT / wireless LAN) or high frequency sources of interference (computers, audio and video equipment) should be higher than 50 centimetres.

However, EnOcean transmitters can be installed next to any other high-frequency transmitters without any problem.

2.2.4 Use of repeaters

In case of a poor radio reception, it may be helpful to use a repeater. EnOcean repeaters do not require any configuration, only a line-power supply is needed. A poor radio signal is received, refreshed and transmitted again, so nearly a double radio range can be achieved. Special EnOcean repeaters which can be switched to 2-level function allow two repeaters to be cascaded.

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3. Configuration

The ME-AC-ENO-1 / 1C (Figure 3.1) has two switches, a button and a profile selector to execute the Learning and Teach-in procedures from the EnOcean technology (explained in Table 3.1 and the following sections)

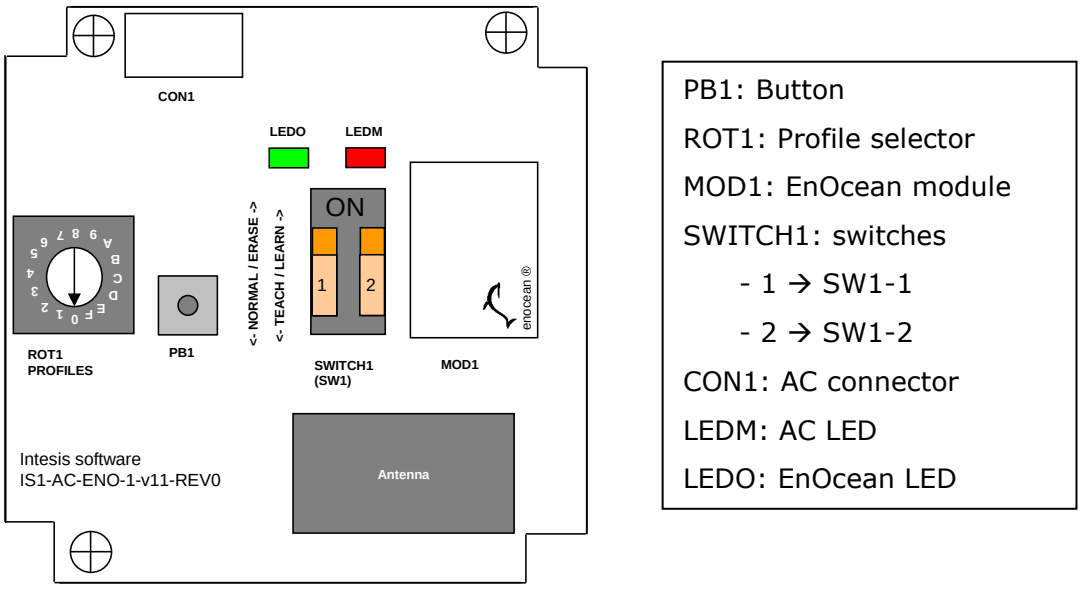

Figure 3.1 Device diagram

The switches in SW1 configure the behaviour of the interface. The different working modes are explained in Table 3.1

Mode	Switch 1 (SW1-1)	Switch 2 (SW1-2)	EnOcean LED (LEDO)	LEDM: AC LED	Button PB1 function
Normal operation / Teach-in	Off	Off	Off	Does not apply	Send a Teach-in telegram or activate monitor mode (pressing it during 5 seconds)
EnOcean Remote Management disablement	Off	On	Does not apply	Does not apply	Leave it in this position to disable the remote management
Learning	On	Off	On	Does not apply	No function
Profile device Erase	On	On	Flashing: 100 ms On/ 100 ms Off	Does not apply	Press during 5 sec Delete the devices in the selected profile
Factory reset	On	On	Flashing: 100 ms On/ 100 ms Off	Flashing: 100 ms On/ 100 ms Off	Press during 10 sec: reset to factory settings (The first 5 seconds it behaves as Profile device erase)

Table 3.1 Device working modes

Selector ROT1 it is used to select the desired profile. The transmission profile is used when the device is in Teach-in mode and the reception one when in Learning or erase mode.

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3.1. *Learning procedure*

The interface ME-AC-ENO-1 / 1C has, by default, 11 reception (Rx) profiles. In the factory configuration each Rx profile is assigned to a control signal of the Mitsubishi Electric AC indoor unit. The Learning procedure allows to link EnOcean devices to control the AC. Up to 5 devices can be linked to each profile (see exceptions in Table 3.2).

The profiles are as follow:

Profile Index Rx (ROT1)	Signal	Allowed devices in profile
0	On/Off	5
1	Mode	5
2	Fan Speed	5
3	Vane position	5
4	Set point Temperature[1]	5
5	Ambient Temperature (virtual) [2]	1
6	Window contact	5
7	KEY CARD[3]	1
8	Occupancy sensor	5
9 a D	N/A	N/A
E	A.C profile	5
F	A.C profile[3]	5

Table 3.2 Default reception profiles

To **execute** the **Learning** procedure the next steps need to be followed. References to device components refer to Figure 3.1:

1. Set switch 1 (SW1-1) to ON position and switch 2 (SW1-2) to OFF. The EnOcean LED will be ON.

2. Set the profile selector (ROT1) in the desired position to link the EnOcean transmitters to the reception profile.

3. Push the Teach-in button of the devices that want to be linked, or if they don't have the Teach-in button (as the EnOcean switches) action them

4. When a valid EnOcean telegram is received the EnOcean LED turns off for 100 milliseconds and then it turns on again. The maximum linked devices in one profile is 5 (check Table 3.2 for special cases). Once this number is reached, no more devices are going to be linked to that profile. The EnOcean LED turns off when that happens.

5. Once the Learning procedure is finished set both SW1-1 and SW1-2 to off for a normal operation of the device. Once that is done the EnOcean LED turns off.

[1] When the Virtual temperature is turned on the set point temperature to be written to the AC unit is the virtual temperature instead of the Set point temperature.
[2] When a device is linked to either of these profiles the virtual temperature function is turned on automatically and the other is disabled so only one temperature reference can be linked. When no device linked it turns off.
[3] Only one device can be linked to this profile

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Profile Index Rx (ROT1)	Supported EEP
0	[05-02-xx] [05-03-xx] [06-00-01] [07-10-01] [07-10-02] [07-10-05]
1	[05-02-xx] [05-03-xx]
2	[05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-04] [07-10-07] [07-10-08] [07-10-09]
3	[05-02-xx]
4	[05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-0A] [07-10-10] [07-10-11] [07-10-12]
5	[07-02-05] [07-02-06] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-07] [07-10-08] [07-10-09] [07-10-0A] [07-10-0B] [07-10-0C] [07-10-0D] [07-10-10] [07-10-11] [07-10-12] [07-10-13] [07-10-14]
6	[05-02-xx] [05-03-xx] [06-00-01] [07-30-02]
7	[05-04-01]
8	[07-07-01] [07-08-01] [07-08-02]
E	[07-20-10] [07-10-03] [07-20-11][1]
F	[07-20-10] [07-10-03] [07-20-11][1]

Table 3.3 ME-AC-ENO-1 / 1C supported reception EEP

Important!

In Profiles E and F up to 5 devices can be linked. It needs to be taken into account that if the devices are working in Multiteach-in mode (more information in 4.5) only one is going to be fully linked as it would take 3 of the 5 spaces available.

[1] HVAC Components (FUNC = 20) Generic HVAC interface (TYPE = 10 and 11) explained in section **¡Error! No se encuentra el origen de la referencia.** and in EnOcean Equipment Profiles (EEP) and V2.1

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3.2. *Teach-in procedure*

The ME-AC-ENO-1 / 1C, as a transmitter device, has the Teach-in procedure implemented. With this procedure the AC can be linked to other EnOcean devices accepting the data send by the ME-AC-ENO.

There are several transmission profiles by default, with several AC signals assigned to them. The send data would contain the state of the AC signals specified in Table 3.4

Profile Index Tx (ROT1)	Transmission signals	EEP (EnOcean Profile)
0	On/Off	[05-02-01]
1	Alarm State	[05-02-01]
2	Set point Temperature	[07-02-05]
3	Ambient Temperature	[07-02-05]
4	Ambient Temperature, Set point Temperature, Fan Speed, On/Off	[07-10-01]
5	AC interface: Mode, fan speed, vane position, sensors and On/Off	[07-20-10]
6	Set point Temperature, Ambient Temperature	[07-10-03]
7	AC interface: AC Error code, Error state and disablements	[07-20-11]
8 to D	N/A	
E	All	[07-20-10][1] [07-10-03] [07-20-11]
F	All	[07-20-10][1] [07-10-03] [07-20-11]

Table 3.4 Signals linked to ROT1 **(Figure 3.1)**

To **execute** the **Teach-in** procedure:

1. Set the switches SW1-1 and SW1-2 to OFF
2. Set the profile selector (ROT1) to the desired transmission profile for the Teach-in procedure
3. Press PB1 to send a teach-in telegram. There must be a receiving in Learning mode for the linking to happen.

Remember that in this procedure the ME-AC-ENO-1 / 1C interface doesn't keep information from any of the devices.

Important!

In Profiles E and F three EEP's are sent pressing PB1 only once. These EEP's are sent with three different Base ID and therefore they behave in fact as 3 different devices. More information in section 4.5.

[1] Multiteach-in process: The three EEp's are sent one after the other pressing the teach-in button only once.

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3.3. *Device deleting procedure*

To delete one or all the devices linked in one reception profile (Table 3.2) the device needs to be in ERASING mode. To do so follow the following lines (the references to device components are specified in Figure 3.1):

1. Set the profile selector (ROT1) to the desired reception profile where the device/s to be deleted are saved.

2. Set the switches SW1-1 and SW1-2 to ON. The EnOcean LED (LEDO) will turn into flashing (100 ms on and 100ms off)

3. Push the Teach-in button of the devices that want to be linked, or if they don't have the Teach-in button (as the EnOcean switches) action them. Once the telegram is received the EnOcean LED will be on for 1 second to show the device has been deleted from this profile.

4. Once finished, set the switches SW1-1 and SW1-2 to OFF for a normal operation of the device

A device can break down or be lost, and therefore the above mentioned delete procedure would not be possible to be executed. For that reason all the devices in one profile can be deleted. To do so follow the instructions (the references to device components are specified in Figure 3.1):

1. Set the profile selector (ROT1) to the desired reception profile.

2. Set the switches SW1-1 and SW1-2 to ON. The EnOcean LED (LEDO) will turn into flashing (100 ms on and 100ms off)

3. Press the button PB1 for 5 seconds. Once that is done the EnOcean LED (LEDO) will be on for 1 second to show that all devices in this profile have been deleted.

4. Once finished, set the switches SW1-1 and SW1-2 to OFF for a normal operation of the device

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4. Special Behaviours

In this section it is explained the special behaviour of the ME-AC-ENO-1 / 1C when certain kinds of devices are used: Window contacts, thermostat with external temperature sensor, occupancy sensors and key card. The use of these sensors needs further explanation as the ME-AC-ENO-1 / 1C realizes special operations or assume previous states. All the explanations in these sections are related to the factory settings of the device.

4.1. *Window contact*

The ME-AC-ENO-1 / 1C has the functionality to automatically control the turning on and off of the AC indoor unit depending on the state of one or several (up to 5) EnOcean window contacts.

EnOcean window contacts periodically send its state and they do so too after a change in the window state happens.

When a window contact is associated to the ME-AC-ENO-1 / 1C interface it is assumed that the window is closed until the correct state of the window contact is received.

The AC indoor unit will be turned OFF and disabled if **any** of the window contacts linked to the window contact profile is sending a "window opened" message for a certain period of time (default value: 30 seconds). If the AC indoor unit is set to ON (either by an EnOcean device of by the remote control) the ME-AC-ENO-1 / 1C will set it back to OFF.

When all the window contacts are sending a "window closed" message, the AC indoor unit will go back to its previous state.

The functionality specified on the above lines would only be active when devices are linked in the window contact profile (Table 3.2).

The information about the states of the linked window contacts would be lost if there is a power down in the system, but it will restore itself in a brief period of time as the window contacts send their state periodically.

4.2. *External temperature Sensors. Virtual temperature*

The AC indoor units have an internal temperature sensor that it is used to reach the set point temperature.

This sensor is normally placed in the return pipe or in a position that does not matches where the thermostat is placed. That can create an issue as the AC unit and the thermostat are not measuring the same ambient temperature.

There is the possibility to place an EnOcean thermostat with its own temperature sensor and be wanted to use this temperature to control the AC unit and not the internal AC sensor. It is then when it appears the virtual temperature concept.

This behavior is only activated when there is an external temperature device linked to either profile 5 or profile F. Once a device is linked to one of these profiles the other is going to be disabled as the AC unit can only work with one external temperature as a reference.

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Four temperatures are involved:

- Set point temperature: It is the set point temperature sent to the AC unit (S)
- Ambient temperature: It is the ambient temperature measured by the AC unit (T)
- Virtual Set point temperature: It is the Set point temperature requested by the thermostat (S_v)
- Virtual Ambient temperature: It is the ambient temperature measured by the thermostat (T_v)

The way to solve this situation is to know which Set point temperature needs to be send to the AC unit, so it regulates its own behaviour with the external thermostat temperature.

For that to happen, the difference between the Set point temperature and the ambient temperature needs to be the same as the difference between the Thermostat set point temperature and the thermostat ambient temperature. Doing so, when the temperature measured by the thermostat reaches the set point temperature of the thermostat, the difference between the temperature measured in the AC and its Set point temperature would be zero as it is shown in the formula below:

$$S - T = S_v - T_v$$

From this formula we can then obtain the Set point temperature to be sent to the A.C:

$$S = T + S_v - T_v$$

The maximum and minimum of the AC Set point temperature need to be respected. That's why if the value obtained in the above formula it is higher or lower than these values it is saturated to the corresponding limit.

4.3. *Key Card reader*

Due to the way the Key Cards reader work there is a specific reception profile for it. In this profile (Table 3.2) it is only possible to link one device. If the linked device it is not a key card the correct behaviour of the ME-AC-ENO-1/1C cannot be granted.

When inserting the Key card in the reader the A.C unit is enabled (becomes available to be turned on) but it stays OFF. A manual actuation of another device would be needed to turn it ON.

When the Key card is removed the A.C indoor unit is disabled and turned OFF staying in this state until we insert the Key Card again. If the AC indoor unit is set to ON (either by an EnOcean device of by the remote control) the ME-AC-ENO-1 / 1C will set it back to OFF.

The functionality specified on the above lines would only be active when devices are linked in the Key Card profile (Table 3.2).

The information about the state of the linked key card would be lost if there is a power down in the system. Therefore it would be needed to set the previous state by actuating the key card.

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4.4. *Occupancy sensors*

The ME-AC-ENO-1 / 1C has the functionality to automatically control the behaviour of the AC indoor unit depending on the state of one or several (up to 5) EnOcean Occupancy sensors.

When all the occupancy sensors linked to the device are not detecting any occupancy the ME-AC-ENO-1 will go to non-presence mode following these steps:

1. Wait a certain time period (default value: 10 minutes) where no action is performed.

2. When this time expires the temperature will change depending on the mode. If in Cool the set point would increase 2ºC and if in Heat would decrease 2ºC. If any other mode the set point temperature would not be changed.

3. This would last for a certain period of time (default value: 60 minutes) when the machine would be turned OFF.

If a presence is detected the system will work as follows:

1. If in step 1 or 2: go to the previous state.

2. If in Step 3: do nothing.

The information about the state of the linked Occupancy sensors would be lost if there is a power down in the system. It will recover as soon as a presence signal is received.

4.5. *MultiTeach-in procedure*

AC units have a lot of parameters to control and supervise and with only one 4BS telegram all this information cannot be fitted in. For these reason the ME-AC-ENO-1 / 1C implements, besides standard teach-in, a MultiTeach-in procedure where more than one EEP is sent to be teach at the same time. In the next lines this procedure is going to be further explained.

This procedure is performed only when the profile selector (ROT1) is set to profiles E or F (the ones that implement the HVAC generic EEPs). The way it is implemented is simple. A different Base ID is assigned to each EEP and it is actually performing 3 consecutive teach-in procedures. This allows devices that support the 3 EEP's to automatically link them.

It needs to be taken into account that used in this profile the ME -AC-ENO-1 / 1C is working as if it was three different EnOcean devices at a time.

If this procedure is performed in the opposite way (the ME -AC-ENO-1 / 1C is in Learning mode in profile E or F) 3 devices positions would be taken, implying that only 1 device using MultiTeach-in would be able to be fully link in each profile. If tried again with another device only 2 of the different EEPs are going to be stored.

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5. Communications monitoring

The interface ME-AC-ENO-1 / 1C has two LEDs that show information about the operation of the device.

The green LED is associated to the EnOcean section, and the red LED to the Mitsubishi Electric Air Conditioner one (AC LED)

5.1. *AC communication monitoring mode (RED LED)*

In Table 5.1 it is shown how the AC LED (red) behaves and its meaning

Device state	LEDM (RED) state	ON / OFF Period	Meaning
Turning on	Pulse	On during 5 seconds	Reset or initialization process after start up
During normal operation	Flashing	200ms On 800ms Off	Communication error with A.C. unit
During normal operation	Flashing	1s On 1s Off	Error detected in A.C. unit
During normal operation	Off	-	Normal operation in the A.C communication

Table 5.1 Device estate and AC LED

5.2. *EnOcean communication monitoring mode (GREEN LED)*

Due to the transmitting method (radio) of EnOcean telegrams, the possibility that the ME-AC-ENO-1 /1C is outside the coverage range of one device is possible. For that reason, the interface, as a receiver, has the ability to show when it receives EnOcean telegrams when in monitoring mode.

To **activate** the monitoring mode:

1. Set switches SW1-1 y SW1-2 to OFF
2. Press PB1 for 6 seconds. The EnOcean LED will briefly flash (100ms). From then on, the EnOcean LED will flash every time a valid EnOcean Telegram is received from a linked device to the ME-AC-ENO-1 /1C

To **disable** the monitoring mode:

1. Briefly push (less than 6 seconds) PB1

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6. Technical data and dimensions

The main features of the devices ME-AC-ENO-1 / 1C are shown in Table 6.1. For further detail check the ME-AC-ENO-1 / 1C datasheet

Dimensions	*71 x 71 x 27 mm*
Weight	*60 g*
Operating Temperature	*-25 . . . 85ºC*
Stock Temperature	*-40 . . . 85ºC*
Operating Humidity	*<93% HR, non-condensing*
Stock Humidity	*<93% HR, non-condensing*
Power requirements	12V, 35mA typical
EnOcean Frequencies	*ME-AC-ENO-1: 868 MHz* *ME-AC-ENO-1C: 315 MHz*

Table 6.1 Technical data

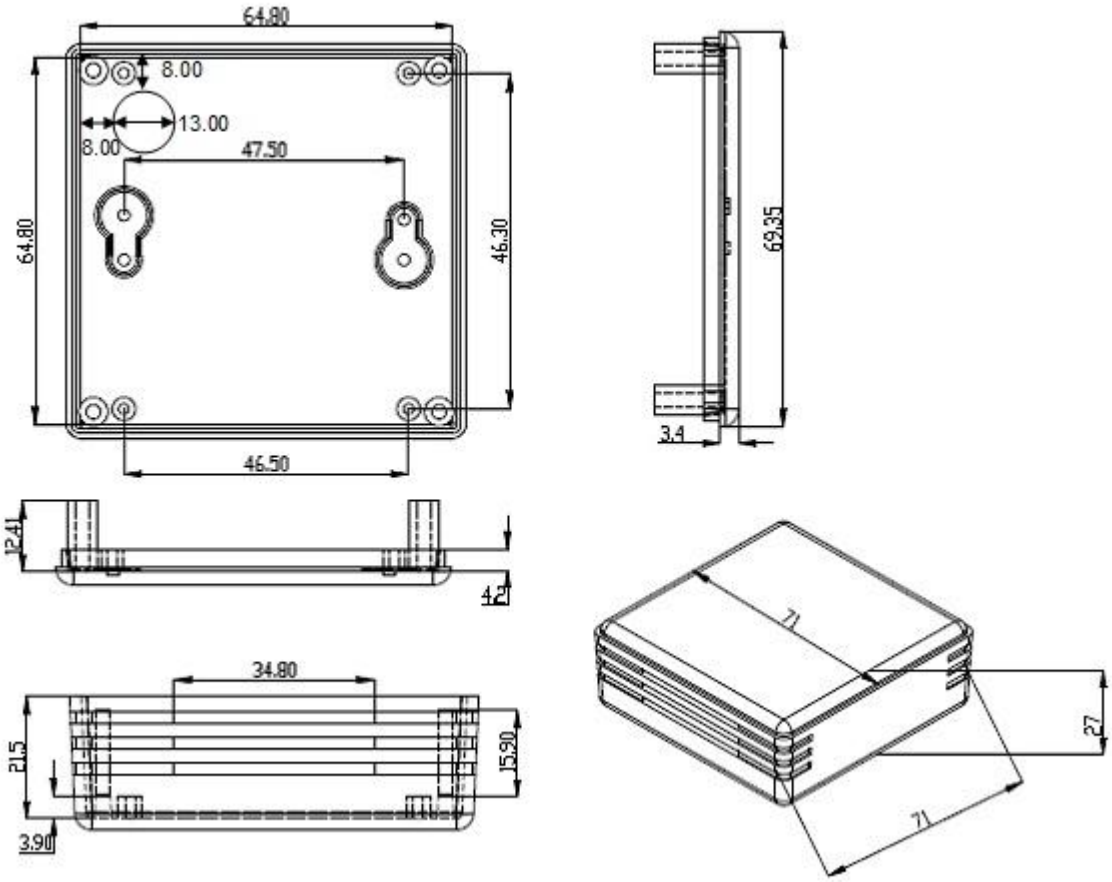

Figure 6.1 Device Dimensions

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7. A.C profile data (Generic HVAC interface)

In this section the *Generic HVAC interface* EEPs (07-20-10 and 07-20-11) applied to the ME-AC-ENO-1 / 1C are explained. These two EEPs along with the *Room Operating Panel* EEP 07-10-03 can transmit and receive all the AC information.

HVAC Components

ORG = 07 (4 BS)
FUNC = 20 HVAC Components

EEP: 07-20-10

TYPE = 10 Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off

EEP for Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off: With this EEP plus the already existing EEP 07-10-03 and 07-20-11 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

Teach-In
The teach-in telegram has the same structure as a normal 4BS telegram.
see. Standardization EnOcean Equipment Profiles (EEP) V2.0
The actuator expected after successful teach-in a 4BS teach-in acknowledge and use the following structure.

DB_3								DB_2								DB_1								DB_0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Profile								Type								Manufacturer ID								LRN Type	EEP result	LRN result	TA	LRN	d.c	d.c	d.c

DB_3: Function, same as teach-in telegram heating valve = 20
DB_2: type, same as teach-in telegram actuator = 01
DB_1: Intesis Software ID:19
DB_0.BIT_7: LRN TYPE = 0b1 (type 1 with profile, manufacturer Id)
DB_0.BIT_6: EEP result; EEP supported = 0b1, EEP not supported = 0b0
DB_0.BIT_5: LRN result; ID stored = 0b1, ID deleted (not stored) = 0b0
DB_0.BIT_4: TA= teach in answer = 0b1
DB_0.BIT_3: LRN Learn button 0b0 Teach-in telegram
0b1 Data telegram
DB_0.BIT_2: not used
DB_0.BIT_1: not used
DB_0.BIT_0: not used

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EEP: 07-20-10 (CONTINUATION)

DATA BYTES

Receive mode: Commands received by the HVAC interface

DB_3	Mode[1]	0	Auto
		1	Heat
		3	Cool
		9	Fan only
		14	Dehumidification (dry)
		33 … 254	reserved
		255	N/A[2]
DB_2 [7 .. 4]	Vane position	0	Auto
		1	Horizontal
		2	Pos2
		3	Pos2
		4	Pos4
		5	Vertical
		6	Swing
		7 .. 14	Not supported
		15	N/A
DB_2 [3 .. 0]	Fan Speed	0	Auto
		1	Low
		2	Mid1
		3	Mid2
		4	High
		5..14	Sets the value to High
		15	N/A
DB_1	Not used		
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0_DB2+ DB_0_DB1:	Room occupancy	00:	Occupied
		01:	StandBy (waiting to perform action)
		10:	Unoccupied (action performed)
		11:	Off (no occupancy and no action)
DB_0.BIT_0)	On/Off	0b0	Off turns the unit to Off
		0b1	On

[1] Other modes don't apply to this AC interface. If any other received it would behave as if it had received and N/A

[2] N/A stands for No Action. It keeps the actual value of the parameter

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EEP: 07-20-10 (CONTINUATION)

Transmit mode: Commands sent by the HVAC interface

DB_3	Mode[1]	0	Auto
		1	Heat
		3	Cool
		9	Fan only
		14	Dehumidification (dry)
		33 … 254	reserved
		255	N/A[2]
DB_2 [7 .. 4]	Vane position	0	Auto
		1	Horizontal
		2	Pos2
		3	Pos2
		4	Pos4
		5	Vertical
		6	Swing
		7 .. 14	Not supported
		15	N/A
DB_2 [3 .. 0]	Fan Speed	0	Auto
		1	Low
		2	Mid1
		3	Mid2
		4	High
		5..14	Sets the value to High
		15	N/A
DB_1	Not used		
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0_DB2+ DB_0_DB1:	Room occupancy	00:	Occupied
		01:	StandBy (waiting to perform action)
		10:	Unoccupied (action performed)
		11:	Off (no occupancy and no action)
DB_0.BIT_0)	On/Off	0b0	Off
		0b1	On

[1] Other modes don't apply to this AC interface. It will only send this ones
[2] N/A: it is send when the actual value of the parameter is not known

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ORG = 07 (4 BS)
FUNC = 20 HVAC Components

EEP: 07-20-11

TYPE = 11 Generic HVAC interface – Error control: AC Error code, Error states and disablements

EEP for Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off: With this EEP plus the already existing EEP 07-10-03 and 07-20-10 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

Teach-In

The teach-in telegram has the same structure as a normal 4BS telegram.
see. Standardization EnOcean Equipment Profiles (EEP) V2.0
The actuator expected after successful teach-in a 4BS teach-in acknowledge and use the following structure.

DB_3								DB_2								DB_1								DB_0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Profile								Type								Manufacturer ID								LRN Type	EEP result	LRN result	TA	LRN	d.c	d.c	d.c

DB_3: Function, same as teach-in telegram heating valve = 20
DB_2: type, same as teach-in telegram actuator = 01
DB_1: Intesis Software ID:19
DB_0.BIT_7: LRN TYPE = 0b1 (type 1 with profile, manufacturer Id)
DB_0.BIT_6: EEP result; EEP supported = 0b1, EEP not supported = 0b0
DB_0.BIT_5: LRN result; ID stored = 0b1, ID deleted (not stored) = 0b0
DB_0.BIT_4: TA= teach in answer = 0b1
DB_0.BIT_3: LRN Learn button 0b0 Teach-in telegram
0b1 Data telegram
DB_0.BIT_2: not used
DB_0.BIT_1: not used
DB_0.BIT_0: not used

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EEP: 07-20-11 (CONTINUATION)

DATA BYTES

Receive mode: Commands received by the HVAC interface

DB_3	not used		
DB_2	not used		
DB_1 [7 .. 1]	not used		
DB_1.BIT_0	External disablement	0b0	Not disabled
		0b1	Disabled
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0.BIT_2	Disable remote controller	0b0	Enable Remote controller
		0b1	Disable Remote controller
DB_0.BIT_1	Window contact	0b0	Windows opened
		0b1	Windows closed
DB_0.BIT_0	not used		

Transmit mode: Commands sent by the HVAC interface

DB_3	Error code HI		Generated by A.C (Table 10.1)
DB_2	Error code LO		Generated by A.C (Table 10.1)
DB_1 [7 .. 4]	Reserved	0x00	
DB_1.BIT_3	Other disablement	0b0	Not Used
DB_1.BIT_2	Window contact disablement	0b0	Not disabled
		0b1	Disabled
DB_1.BIT_1	Key card disablement	0b0	Not disabled
		0b1	Disabled
DB_1.BIT_0	External disablement	0b0	Not disabled
		0b1	Disabled
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0.BIT_2	Disable remote controller	0b0	Enable Remote controller
		0b1	Disable Remote controller
DB_0.BIT_1	Window contact	0b0	Windows opened
		0b1	Windows closed
DB_0.BIT_0	Alarm State	0b0	OK
		0b1	Error

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8. AC Unit Types compatibility

A list of Mitsubishi Electric indoor unit model references compatible with ME-AC-ENO-1 / 1C and their available features can be found in:

http://www.intesis.com/pdf/IntesisBox_ME-AC-xxx-1_AC_Compatibility.pdf

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9. Error Codes

Code	Description
0	No active error
1102	Discharge Temperature high
1108	Internal thermostat detector working (49C)
1110	Outdoor unit fail
1300	Pressure low
1302	Pressure high (High pressure probe working 63H)
1503	Protection against freeze or battery high temperature
1504	Protection against freeze or battery high temperature
1504	Over heating protection
1509	High pressure error (ball valve closed)
1520	Super heating anomaly due to low temp. of discharge. (TH4)
2500	Erroneous operation of drain pump
2502	Erroneous operation of drain pump
2503	Drain sensor anomaly (DS)
4030	Serial transmission error
4100	Compressor pause due to excess of current (initial block)
4101	Compressor pause due to excess of current (overload)
4102	Phase detection opened
4103	Anti-phase detection
4108	Phase opened in phase L2 or connector 51CM opened
4118	Error in the anti-phase detector (electronic board)
4124	Connector 49L opened
4210	Cut due to over-current of compressor
4220	Voltage anomaly
4230	Radiator panel temperature anomaly (TH8)
5101	Ambient temperature probe anomaly (TH1), indoor unit
5102	Liquid probe anomaly (TH2)
5102	Cond/Evap probe anomaly (TH5)
5104	Error detection in discharge temperature
5105	Outdoor probe error TH3
5106	Outdoor probe errorTH7
5107	Outdoor probe errorTH6
5110	Outdoor probe errorTH8
5202	Connector 63L opened
5300	Current probe error
6600	MNET duplicated address definition
6602	MNET Line transmission hardware error
6603	MNET BUS busy
6606	MNET Line transmission error
6607	MNET transmission error
6607	MNET without ack
6608	MNET transmission error
6608	MNET without response
6831	IR remote control transmission error (reception error)
6832	IR remote control transmission error (transmission error)
6840	Transmission error with the indoor/outdoor unit (reception error)
6841	Transmission error with the indoor/outdoor unit (transmission error)
6844	Error in inter-connection cable in the indoor/outdoor unit, indoor unit number deactivated (5 min or more)
6845	Error in inter-connection cable in the indoor/outdoor unit (cabling error, disconnection)
6846	Initial timer deactivated
65535	Communication error with the A.C.

Table 9.1 Error codes

☞ In case you detect an error code not listed, contact your nearest Mitsubishi Electric technical support service.

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10. EnOcean Interoperability

In this section there is a list of the allowed transmission and reception EEP

EEP Tx	EEP [1] description
[05-02-01]	Light and Blind Control – Application Style 1
[07-02-05]	Temperature Sensor. Range 0°C to +40°C
[07-10-01]	Temperature Sensor; Set Point, Fan Speed and Occupancy Control
[07-10-03]	Temperature Sensor; Set Point Control
[07-20-10]	HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off
[07-20-11]	HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements

Table 10.1 Allowed transmission (Tx) EEP

EEP Rx	EEP description
[05-02-xx]	Rocker Switch, 2 Rocker
[05-03-xx]	Rocker Switch, 4 Rocker
[05-04-01]	Key Card Activated Switch
[06-00-01]	Single Input Contact
[07-02-05]	Temperature Sensor. Range 0°C to +40°C
[07-02-06]	Temperature Sensor. Range +10°C to +50°C
[07-07-01]	Occupancy Sensor
[07-08-01]	Light, Temperature & Occupancy Sensor
[07-08-02]	Light, Temperature & Occupancy Sensor
[07-10-01]	Temperature Sensor; Set Point, Fan Speed and Occupancy Control
[07-10-02]	Temperature Sensor; Set Point, Fan Speed and Day/Night Control
[07-10-03]	Temperature Sensor; Set Point Control
[07-10-04]	Temperature Sensor; Set Point and Fan Speed Control
[07-10-05]	Temperature Sensor; Set Point and Occupancy Control
[07-10-06]	Temperature Sensor; Set Point and Day/Night Control
[07-10-07]	Temperature Sensor; Fan Speed Control
[07-10-08]	Temperature Sensor; Fan Speed and Occupancy Control
[07-10-09]	Temperature Sensor; Fan Speed and Day/Night Control
[07-10-0A]	Temperature Sensor, Set Point Adjust and Single Input Contact
[07-10-0B]	Temperature Sensor and Single Input Contact
[07-10-0C]	Temperature Sensor and Occupancy Control
[07-10-0D]	Temperature Sensor and Day/Night Control
[07-10-10]	Temperature and Humidity Sensor; Set Point and Occupancy Control
[07-10-11]	Temperature and Humidity Sensor; Set Point and Day/Night Control
[07-10-12]	Temperature and Humidity Sensor; Set Point Control
[07-10-13]	Temperature and Humidity Sensor; Occupancy Control
[07-10-14]	Temperature and Humidity Sensor; Day/Night Control
[07-20-10]	HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off
[07-20-11]	HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements
[07-30-02]	Digital Input. Single Input Contact

Table 10.2 Allowed reception (Rx) EEP

[1] EnOcean Equipment Profiles (EEP) V2.0

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11. Regulations and standards

CE conformity:

R&TTE EU-directive on Radio and Telecommunications Terminal Equipment

The general registration for the radio operation is valid for all EU countries as well as for Switzerland.

Standards:

UNE-EN 50491-3:2010
UNE-EN 60950-1:2007
UNE-EN 61000-6-2:2006
UNE-EN 61000-6-3:2007

FCC ID: SZV-STM300C
IC: 5731A-STM300C

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by Intesis Software may void the FCC authorization to operate this equipment.

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